

**REMARKS**

This Request for Reconsideration is supplemental to the Amendment that was filed by Applicants on December 5, 2007.

**Interview**

Applicants thank Examiner Lu for granting a telephonic interview to their representative, Richard Gallagher, on January 9, 2007. The Examiner's position expressed at the bottom of page 2 of the Final Rejection and repeated in the Advisory Action ("the process claimed in claims 6-8, 10, and 12-19 does not produce the propylene copolymer particle of Claims 3-5 and 20; instead, the claimed process produce[s] a particle wherein the ethylene polymer is the center of the polymer particle") was discussed. The Examiner also referred to the claim 3 recitation regarding staining – the Examiner questions how a core layer could possibly be stained, since it is not exposed, and instead is covered by outer layers.

**Method of making the invention**

The Examiner contends that the three-layered polypropylene particles prepared in Applicants' working examples do not have the structure in which the outermost layer is polyethylene, the middle layer is polypropylene, and the core is a propylene homopolymer or copolymer, as recited in Applicants' claims. The Examiner stated on the third page of the Advisory Action that "the claimed process produce[s] a particle wherein the ethylene polymer is the center of the polymer particle." Applicants respectfully point out to the Examiner that the invention of this application involves propylene copolymer particles comprising three layers L1,

L2, and L3. The processes to form each layer L1, L2, and L3 correspond respectively to P1, P2, and P3. The first process P1 is a process to form a polyethylene layer (outer layer L1). The second process P2 is a process to form a polypropylene layer (middle layer L2). P3 is the third process, to form a propylene homo- or co-polymer (core L3). The working examples show the processes successively performing P1, P2, and P3. Accordingly, the propylene copolymer particles shown in the working examples are the same propylene copolymer particles as the three-layered particles in the claims.

It is noted that in the formation of polymer particles in accordance with the present invention, the outer layer is produced first since the production center of the catalyst is at the core of the polymer particle. When this was discussed with the Examiner telephonically, the Examiner appeared to believe that it is "not possible" that the outer layer is produced first.

Applicants respectfully submit evidence to rebut the Examiner's contention that the core of the particles produced by the claimed process is made of polyethylene. Specifically, enclosed in an Information Disclosure Statement filed concurrently herewith is a 1991 paper by Galli, *et al.* of HIMONT Incorporated. The paper is entitled "The Reactor Granule - A Unique Technology for the Production of a New Generation of Polymer Blends." It was presented at the Polyolefins VII International Conference of the Society of Plastics Engineers in Houston, Texas, on February 24-27, 1991.

The Examiner's attention is directed, for instance, to the paragraph bridging pages 30-31 thereof, wherein the authors teach that "The polymer chains grow not only outwards from the surface, but also inwards causing the granule to expand progressively." See also, *e.g.*, Figure 5 on page 38 of the Galli, *et al.* paper. The Examiner has presented no objective evidence to cast

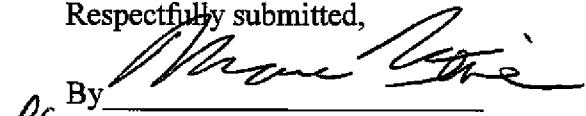
doubt on Applicants' contention that in the formation of polymer particles in accordance with the present invention, *the outer layer is produced first*. There is no sustainable basis for the sole remaining rejection of record.

Contact information

If there are any further issues that need to be resolved in the present application, the Examiner is respectfully requested to contact Richard Gallagher (Registration No. 28,781) at (703) 205-8008.

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Respectfully submitted,

By   
Marc S. Weiner

Registration No.: 32,181  
BIRCH, STEWART, KOLASCH & BIRCH, LLP  
8110 Gatehouse Road  
Suite 100 East  
P.O. Box 747  
Falls Church, Virginia 22040-0747  
(703) 205-8000  
Attorney for Applicant

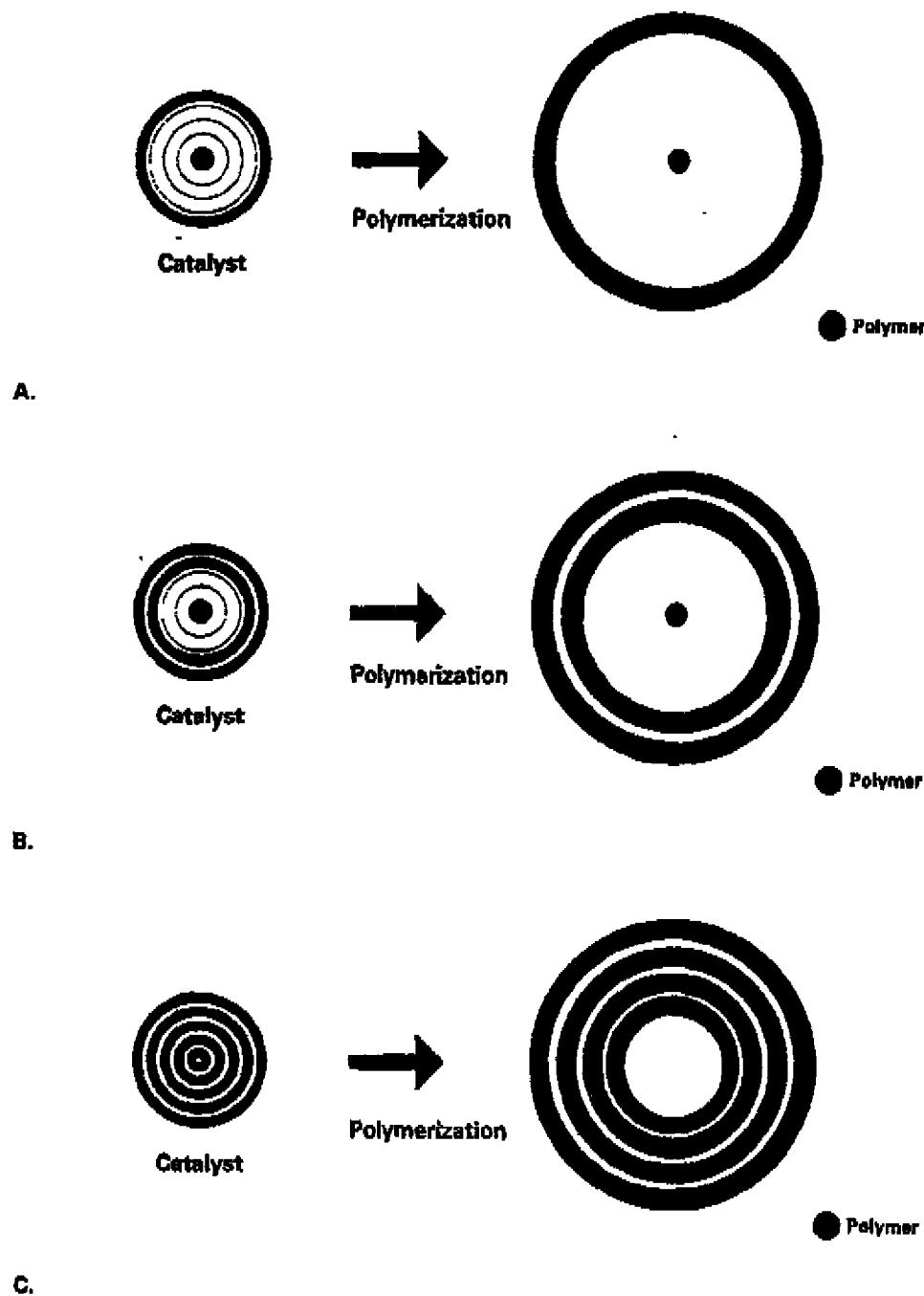
own specific support system. At Montedison's Giulio Natta Research Center in Ferrara, Italy it was discovered that active  $MgCl_2$  was a very effective support for ethylene polymerization. It was also highly active in propylene polymerization but was not sufficiently stereospecific for a viable commercial production process. Systematic research in the Montedison laboratories was undertaken in order to increase the stereospecificity, and the important role of the Lewis-base donors was recognized. A further key discovery and a most significant advance in Ziegler-Natta catalysis, was recognition of the importance of the "catalyst architecture". The physical and chemical structure of the support influences the number and type of active centers, the crystal dislocations and accessibility for the monomer, and, consequently, the selectivity of the polymerization active centers. It also determines the shape and the mechanical properties of the catalyst particles themselves.

The influence of the "catalyst architecture" is one of the most complex and difficult to understand and control in Ziegler-Natta catalysis and has been the major focus of research in the characterization and development of third generation catalysts. Montedison and Himont have been in the forefront of this research and have achieved a good degree of understanding and, more importantly, control of the properties of the supported catalysts. A summary of this understanding can be given as follows.

The physical and chemical structure of the active sites on the support can be constructed to provide a three-dimensional architecture that can be duplicated by the growing particle, and within which the active sites are equally accessible to the monomer and polymerization reaction. When the monomer reaches the catalyst particle, it initially reacts at the most accessible active sites on the surface. The polymer begins to grow, not only on the surface, but also on those accessible active sites inside the crystal granule. The polymer chains grow not only outwards from the surface, but

also inwards causing the granule to expand progressively. It is this process that is particularly critical in the initial phase of the polymerization and is controlled by the physical and mechanical properties of the support. Replication of the catalyst particle shape occurs if the mechanical strength of the catalyst granule is in balance with the catalyst polymerization activity. If reactivity is too high, an uncontrolled "explosion" occurs: the mechanical forces generated by the growing polymer chain fracturing the granules into a fine polymer powder. If the mechanical strength of the catalyst particle is too great, a low level of reactivity occurs because the internal active sites cannot generate polymer for lack of space. A good replication and a high activity only occurs when the mechanical strength and the polymerization reactivity of the supported, third generation catalysts are well balanced. (Figure 4)

Himont/Montedison has developed Magnesium Chloride as an activating support for the catalyst, and it can be shaped into uniform spherical or globular particles of varying sizes. Careful control in the preparation of this catalyst system results in a polymerization process in which a growing skin of polymer is formed from the expanding catalyst active sites. Inside this solid polymer skin, further polymerization can take place, controlled by the monomer diffusion rate. The most favored active centers, from a diffusion point of view, are located on the external layers of the catalyst particle, and generate polymer at the maximum polymerization rate. (Figure 5) The polymerization rate will progressively decrease in the various catalyst granule layers from the external surfaces to the core. The initial polymer granules thus generated assume a spherical shape whose density decreases progressively from the outside skin to the particle's core. As the surface layer's polymerization rate declines, the inner catalyst layer's active centers become the most-favored polymerization sites. Manipulation of the process conditions and the catalyst architecture by modifications that change the polymerization rate in the interior of the granule relative to that on the



Representation of Polymerization with Perfect Replication of a Spherical Form Supported Catalyst